

Claims

The listing of claims below replaces all prior versions and listings of claims in the application:

1. (Currently Amended) A nozzle assembly located at the bottom of an FCC riser comprising:

a plurality of feed nozzles;

a catalyst source within the riser; and,

a discharge end of each said feed nozzle for ejecting a mixture of hydrocarbon feed and atomization gas into said riser; and

a mixing zone at the discharge end of at least one feed nozzle such that the mixture is fed into the catalyst;

wherein each nozzle has its axis parallel to the axis of said riser at the bottom, and said discharge ends of said nozzles are canted inwardly towards the axis of said riser at the bottom.

2. (Currently Amended) The nozzle assembly of claim 1 wherein said discharge ends are canted 5° to 75°, ~~more preferably 10° to 40°~~ from their axes.

3. (Original) The apparatus of claim 1 further including a mechanical connecting means for physically fixing the position of said feed nozzles with respect to each other.

4. (Original) The apparatus of claim 1 further including a central steam nozzle for supplying emergency steam.

5. (Original) The apparatus of claim 1 further including a means for supplying pre-fluidizing gas.

6. (Original) The apparatus of claim 1 wherein said nozzles are arranged equidistant around said riser axis.

7. (Original) The apparatus of claim 6 wherein said nozzles are arranged evenly-spaced in said riser.

8. (Original) The apparatus of claim 6 wherein said nozzles are arranged unevenly-spaced in said riser when said riser is positioned horizontally or inclined.

9. (Currently Amended) The apparatus of claim 1 wherein the number of said nozzles is in the range of two to eight, ~~preferably four to six~~.

10. (Original) The apparatus of claim 2 further including a mechanical connecting means for physically fixing the position of said feed nozzles with respect to each other.

11. (Original) The apparatus of claim 2 further including a central steam nozzle for supplying emergency steam.

12. (Original) The apparatus of claim 2 further including a means for supplying pre-fluidizing gas.

13. (Original) The apparatus of claim 2 wherein said nozzles are arranged equidistant around said riser axis.

14. (Currently Amended) The apparatus of claim 2 wherein the number of said nozzles is in the range of two to eight, ~~preferably four to six~~.

15. (Original) An apparatus for contacting a catalyst and hydrocarbon feed in a fluid catalytic cracking process comprising: a first conduit for supplying regenerated catalyst; a second conduit having an opening connected to the outlet end of said first conduit for receiving said regenerated catalyst; and, a feed nozzle assembly located within said second conduit for supplying a mixture of hydrocarbon feed and steam into said catalyst, said feed nozzle assembly within said second conduit comprising a plurality of feed nozzles, and wherein the axis of each nozzle is parallel to the axis of said second conduit at the bottom, wherein

each nozzle includes a discharge end canted inwardly toward the axis of said second conduit for ejecting said hydrocarbon feed and atomization steam therefrom and into said second conduit to contact with said regenerated catalyst.

16. (Canceled) A method for achieving a desirable feed and catalyst contacting condition in a fluid catalytic cracking unit comprising the steps of: supplying regenerated catalyst to a conduit; placing a plurality of feed nozzles in said conduit; canting the discharge end of each said feed nozzle toward the axial center of said conduit; supplying a hydrocarbon feed to an inlet in said feed nozzle; supplying an atomization fluid into said feed nozzle through a second inlet in said feed nozzle; mixing said hydrocarbon feed and said atomization fluid in said feed nozzle; expelling the resulting mixture of said hydrocarbon feed and said atomization fluid through an opening in said canted discharge end of said feed nozzle; contacting mixture of said hydrocarbon feed and said atomization fluid said with said regenerated catalyst directly and immediately at said discharge end of said feed nozzle; and expelling the resulting mixture of said regenerated catalyst and said hydrocarbon feed and atomization gas through an exhaust end of said second conduit.